

# **Sand and Gravel Mining Floodplain Use Permit Application Guidelines**

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**Flood Control District of Maricopa County  
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# **Flood Control District of Maricopa County**

## **Sand and Gravel Mining Floodplain Use Permit**

### **Application Guidelines**

## **Table of Contents**

<u>Section 1: Overview of Floodplain Use Permit Process</u> .....	p. 1-1
Statement of Purpose .....	p. 1-1
Sand and Gravel Mining Policies.....	p. 1-2
Sand and Gravel Mining Floodplain Use Permit Process .....	p. 1-3
<u>Section 2: Floodplain Use Permit Review Submittal Checklist</u> .....	p. 2-1
<u>Section 3: Required Information for All Sand and Gravel Floodplain Use Permits</u> .....	p. 3-1
General Information .....	p. 3-1
Site Plan Requirements .....	p. 3-1
Flood Hazard Zone Boundaries Map .....	p. 3-2
Reclamation Plan .....	p. 3-3
Engineering Report .....	p. 3-3
Certification .....	p. 3-3
Notification .....	p. 3-4
<u>Section 4: Permit Renewal Process for Existing Sand and Gravel Operations</u> .....	p. 4-1
Legal Non-Conforming Operations (Grandfathered).....	p. 4-1
Existing Permitted Sand and Gravel Excavations.....	p. 4-1
Non-Complying Excavations.....	p. 4-2
District Inspection.....	p. 4-3
Transfer of Floodplain Use Permit .....	p. 4-3
<u>Section 5: Permit Requirements for New Sand and Gravel Operations</u> .....	p. 5-1
Minor Excavations .....	p. 5-1
Streamlined Permit Applications .....	p. 5-1
Excavations Within the Main Channel, Floodway or Erosion Hazard Zone .....	p. 5-1
Excavations Entirely Outside the Main Channel, Floodway and Erosion Hazard Zone .....	p. 5-4
Major Excavations Not Meeting Streamlined Criteria.....	p. 5-4
Sand and Gravel Excavations Outside the Regulatory Floodplain and Erosion Hazard Zone .....	p. 5-4
<u>Section 6: Engineering Report Requirements</u> .....	p. 6-1
General Information .....	p. 6-1
Floodplain Analysis .....	p. 6-3
Lateral Erosion Hazard Analysis .....	p. 6-5
Structural Measure Design.....	p. 6-8
Impacts Analysis.....	p. 6-9
Local Drainage Analysis.....	p. 6-13
Statement of Findings .....	p. 6-14
Documentation .....	p. 6-14
<u>Section 7: Reclamation Plans</u> .....	p. 7-1
Section 7 Guidelines are in Progress.	



# **Flood Control District of Maricopa County**

## **Sand and Gravel Mining Floodplain Use Permit**

### **Application Guidelines**

<b>Section 8: Certification Forms</b> .....	p. 8-1
Certificate of Agency Permit Compliance .....	p. 8-2
Owner's Letter of Authorization .....	p. 8-3
Transfer of Floodplain Use Permit Agreement Form .....	p. 8-4
Assurance of Compliance Forms .....	p. 8-5
Existing Floodplain Use Permit Renewal or Amendment .....	p. 8-6
<b>Section 9: Approval, Compliance and Site Inspection of Active Permits</b> .....	p. 9-1
<b>Section 10: General Stipulations for Sand and Gravel Floodplain Use Permits</b> .....	p. 10-1
<b>Section 11: Technical References for Engineering Analyses of In-Stream Mining</b> .....	p. 11-1
General Technical References – River Mechanics and Sedimentation Engineering .....	p. 11-1
General Technical References – Fluvial Geomorphology .....	p. 11-1
Lateral Erosion .....	p. 11-2
Sediment Transport Modeling .....	p. 11-2
Scour .....	p. 11-3
Long-Term Degradation .....	p. 11-3
Headcutting .....	p. 11-3
Design of Engineering Structures .....	p. 11-4
Floodplain Delineation .....	p. 11-5
Reclamation .....	p. 11-5
In-Stream Sand and Gravel Mining – Impacts on Channel Stability .....	p. 11-6
Mining Guidelines and Management Recommendations .....	p. 11-7
Sedimentation Engineering Reports on Arizona River Systems .....	p. 11-8
In-Stream Mining Regulations .....	p. 11-9
Sand and Gravel Mining – Economic Impacts .....	p. 11-9
<b>Section 12: Glossary</b> .....	p. 12-1
Terms defined in the glossary are denoted at their first occurrence by SMALL CAPS font.	
<b><u>Appendixes: Case Histories of In-Stream Mining Impacts</u></b>	
Appendix A. Case History #1: Bridge Failure Indian School Road, Agua Fria River, February 1980	
Appendix B. Case History #2: Headcutting Tujunga Wash, February 1969	
Appendix C. Case History #3: Lateral Erosion Ina Road, Santa Cruz River, October 1983	
Appendix D. Case History #4: Long-Term Degradation Salt River, 1903-2001	

## **Section 1: Overview**

### **Statement of Purpose**

The primary purpose of regulation of sand and gravel mining in WATERCOURSES<sup>1</sup> is to comply with Federal Emergency Management Agency (FEMA) requirements. Federal laws require the Flood Control District of Maricopa County (District) to manage and regulate all FLOODPLAIN DEVELOPMENT within the County. Aggregate mining is included in the Federal definition of development. The DISTRICT looks to Federal law if State law is not specific.

The District has regulated sand and gravel mining within watercourses since February 25, 1974, when the County's first FLOODPLAIN REGULATIONS were established. Like all other floodplain activities and development, sand and gravel mining permitting is based on federal and state requirements for floodplain management:

44 CFR, Chapter 1, Part 59.1 "Development *means any man-made change... including... mining, dredging, filling, GRADING, paving, excavation or drilling operations or storage of equipment or materials.*"

ARS 48-3613 Authorization is Required for Construction in Watercourses: "...a person shall not construct any *STRUCTURE* which will divert, retard or obstruct the flow of water in any watercourse without securing written authorization from the BOARD of the district in which the watercourse is located... This paragraph does not exempt those sand and gravel operations which will divert, retard or obstruct the flow of waters in a watercourse from complying with and acquiring authorization..."

The Floodplain Regulations for Maricopa County define development standards and permit requirements for sand and gravel excavation within FLOOD and EROSION HAZARD ZONES

Article I, Section 101.3. Pursuant to the authority granted in A.R.S. §48-3609(B), *judicious floodplain management requires the permitting of development within a watercourse or contributing watershed that have flows greater than 50 cfs (cubic feet per second) during a 100-year flood event so as not to cause OBSTRUCTION retardation or diversion of flows within the area of jurisdiction.*

Article IX, Section 902.7 and Article X, Section 1002.12. [Applicants must] "*show that excavations will not have cumulative ADVERSE IMPACT nor be of such depth, width, length, or location as to present a hazard to life or property or to the watercourse in which they are located and they will comply with any applicable WATERCOURSE MASTER PLAN adopted by the Board of Directors.*"

In the past, the review of sand and gravel operations had been conducted on a case-by-case basis. These guidelines for sand and gravel FLOODPLAIN USE PERMITS will update the existing sand and gravel permitting policies to achieve the following regulatory and management objectives:

- Protect public health, safety, and welfare
- Provide consistency and continuity of District review of floodplain use permit applications
- Create a streamlined process for sand and gravel floodplain use permit approval
- Integrate floodplain permitting with watercourse and drainage master plan recommendations

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<sup>1</sup> Terms defined in the glossary are denoted at their first occurrence by SMALL CAPS font.

Application of these guidelines will provide consistent development of sand and gravel operations without compromising the function of the floodplain, flood control features, or infrastructure. These guidelines supercede all other District permitting guidelines and policies for sand and gravel mining in flood and erosion hazard zones.

## **Sand and Gravel Mining Policies**

The District has established the policies listed below to protect public health, safety, and welfare, to fulfill local, state, and federal mandates for floodplain management, to protect the NATURAL AND BENEFICIAL FUNCTIONS OF FLOODPLAINS, and to minimize the expenditure of public funds for repair of infrastructure in the riverine environment. Mining operations located in the floodplain that meet the intent and criteria described in these policies will be viewed as consistent with the regulatory purpose of the District and may qualify for streamlined permit approval.

- 1.) Aggregate mines should be located outside of the REGULATORY FLOODWAY whenever feasible.
- 2.) Aggregate mines should be located outside of the erosion hazard zone whenever feasible.
- 3.) If aggregate mines are located within the regulatory floodway or erosion hazard zone and no STRUCTURAL FLOOD CONTROL MEASURES are provided, the maximum excavation depth should be no greater than the natural CHANNEL INVERT elevation shown on the EFFECTIVE FLOODPLAIN DELINEATION study (Figure 5-1).
- 4.) If aggregate mines within the floodplain or erosion hazard zone are excavated below the natural channel invert elevation shown on the effective floodplain delineation study, then engineered GRADE CONTROL STRUCTURES should be provided at any point where the 100-year flood could enter the excavation, or ENGINEERED FLOOD CONTROL STRUCTURES shall be provided to prevent the 100-year flood from entering the excavation.
- 5.) Aggregate mines shall have no adverse floodplain, EROSION, or sedimentation impacts on any adjacent or off-site property.
- 6.) Aggregate mining operations must have a RECLAMATION plan that assures the long-term stability of the excavation and the adjacent river system.
- 7.) Aggregate mining operations shall be compatible with the recommendations and policies specified in the approved watercourse master plan for that watercourse.
- 8.) Technical reports submitted in support of aggregate mining floodplain use permits should be prepared by experienced Arizona-registered professional engineers with relevant expertise in hydrology, hydraulics, sediment transport, river mechanics, FLUVIAL GEOMORPHOLOGY, and local stream systems.

The District has determined that in-stream mining in flood and erosion hazard zones can damage public infrastructure, private property, and public welfare. This determination is based on the District's experience gained from repair of flood damages, engineering studies, research, technical reports, historical documentation, and practical experience.<sup>2</sup> Therefore, more detailed engineering analyses will

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<sup>2</sup> Case histories of flood and erosion damages related to in-stream sand and gravel mining are provided in Section 12 of this document. Additional references describing mining-related stream impacts are provided in Section 11.

be required to support any floodplain use permit application that does not meet the intent and criteria of the policies listed above.

## Sand and Gravel Mining Floodplain Use Permit Process

All sand and gravel excavations located in a flood or erosion hazard zone must receive a floodplain use permit or FLOODPLAIN CLEARANCE, excluding LEGAL NON-CONFORMING (a.k.a., grandfathered) operations that existed prior to adoption of the Floodplain Regulations for Maricopa County. Legal non-conforming operations require assurance that their mining operation has remained within the original, legal non-conforming mining limits as defined in Section 4. Figure 1-1 outlines the permit application and approval process described in these guidelines.

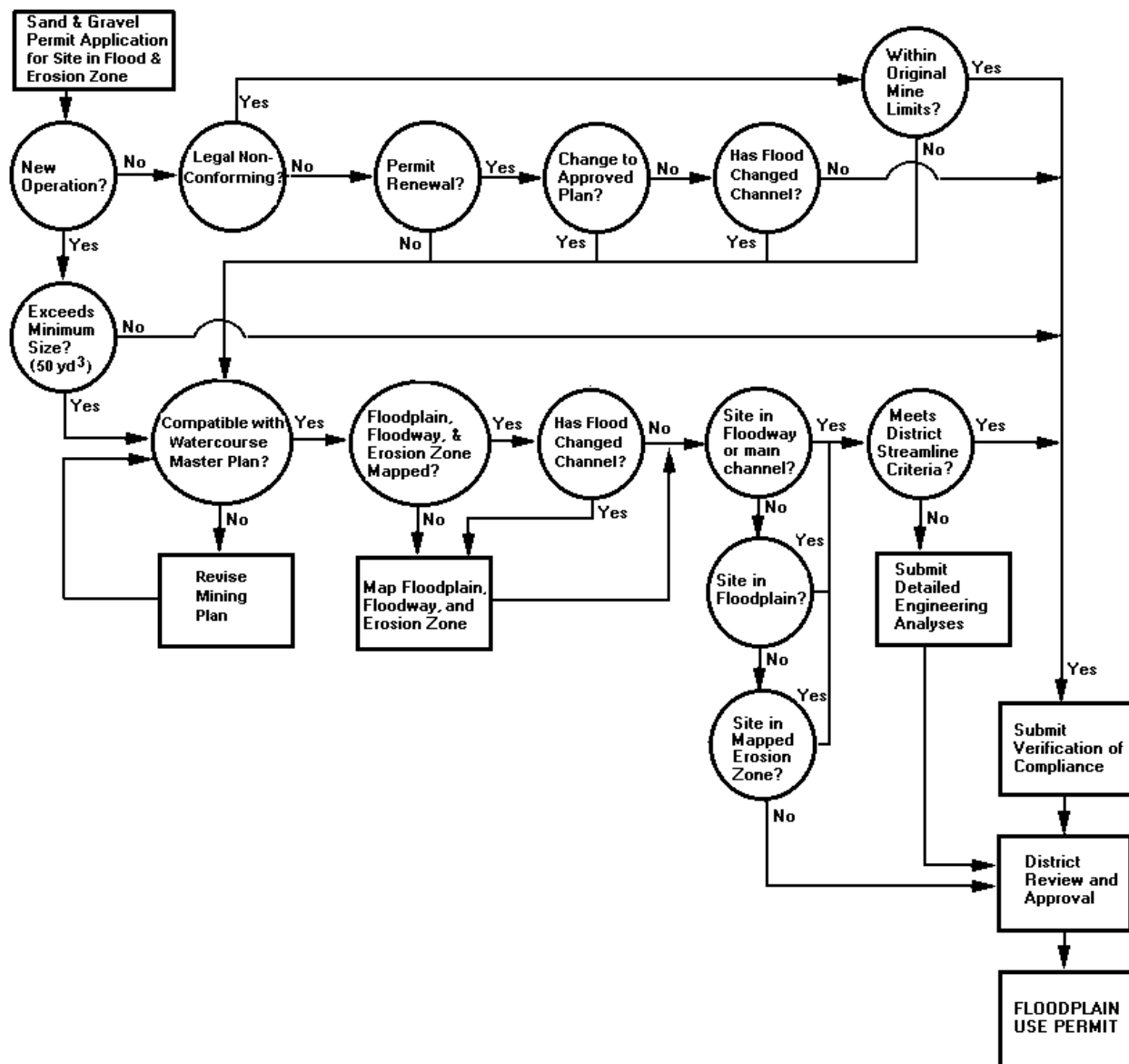


Figure 1-1. Flow chart showing the floodplain use permit application process for sand and gravel mines.

As shown in Figure 1-1, the application approval process can be streamlined by excavating outside the flood and erosion hazard zone, by limiting the size of the excavation to less than 50 yd<sup>3</sup> or by meeting the

District's "streamlined criteria" for excavations in the FLOOD HAZARD ZONE, as described in Section 4, or by documenting compliance with the conditions of a previously approved floodplain use permit.



## **Section 2: Review Submittal Checklist**

### **Sand and Gravel Mining Floodplain Use Permit**

The checklist below will be used as a guideline to determine if a floodplain use permit application is complete. Additional data or analyses may be required depending on the complexity of the proposed design or the location of the excavation, as described in the following sections.

#### **Floodplain Use Permit Application Form**

\_\_\_1. Application form completed including narrative description of mining operation

#### **Site Plan Cover Sheet**

- \_\_\_1. Project name and address
- \_\_\_2. Legal description or assessor's tax id of property
- \_\_\_3. Firm name, address, contact name and phone number of firm operating mine
- \_\_\_4. Property owner name, address and phone number
- \_\_\_5. Mine supervisor name, address and phone number
- \_\_\_6. Engineer of record name, address and phone number
- \_\_\_7. Site location and vicinity map
- \_\_\_8. Map showing ownership of adjacent parcels
- \_\_\_9. General notes and legend, if applicable
- \_\_\_10. Benchmark information – description, location, and on-site horizontal and vertical datum
- \_\_\_11. Arizona registered professional engineer's seal, date and signature

#### **Site Plan Sheet(s)**

#### **(Detailed Information in Section 3)**

- \_\_\_1. Map information - north arrow, scale, property lines and dimensions
- \_\_\_2. Existing condition topographic mapping
- \_\_\_3. Proposed excavation and grading
- \_\_\_4. Locations of proposed flood and erosion control structures and features (if any)
- \_\_\_5. Location of existing and proposed BUILDINGS, processing, stockpiling, storage areas and haul roads
- \_\_\_6. Flood hazard zone boundary - floodplain, FLOODWAY, EROSION HAZARD ZONE LIMITS (cite source)
- \_\_\_7. Topographic cross section(s):
  - a. Perpendicular to watercourse through site and adjacent watercourse(s)
  - b. Parallel to watercourse through excavation at deepest points
- \_\_\_8. Project phasing plan for permit period and ultimate build out of mine
- \_\_\_9. Arizona registered professional engineer's seal, date and signature

#### **Engineering Report\***

#### **(Detailed Information in Section 6)**

- |                                       |                                                                                           |
|---------------------------------------|-------------------------------------------------------------------------------------------|
| ___1. General Information             | ___6. Structural Measure Design                                                           |
| ___2. Floodplain Analysis             | ___7. Statement of Findings                                                               |
| ___3. Lateral Erosion Hazard Analysis | ___8. Documentation - engineering calculations and modeling to support results and design |
| ___4. Impacts Analysis                | ___9. Registered engineer's seal, date and signature                                      |
| ___5. Local Drainage Analysis         |                                                                                           |

#### **Reclamation Plan Sheet(s)\***

#### **(Detailed Information in Section 7)**

- \_\_\_1. Proposed final contours, elevations, slopes. Meets District requirements
- \_\_\_2. Arizona registered professional engineer's seal, date and signature

#### **Certification Forms**

#### **(Detailed Information in Section 8)**

- \_\_\_1. Completed certification form sealed by Arizona registered engineer
- \_\_\_2. Statement of compliance with other agency permits (404, 401, ADOT, AZPDES, etc.)
- \_\_\_3. Property owner's notarized authorization letter
- \_\_\_4. Certification of right-of-entry and access

\* Not required for streamlined mining permit (Section 5) or legal non-conforming operations (Section 4).

## **Section 3: Required Information**

### **All Sand and Gravel Floodplain Use Permit Applications**

All applications for new or renewed sand and gravel mining floodplain use permits must include the information listed below. For permit renewals, only updated or modified information is required. Inclusion of the information listed below on the cover sheet and site plans, and in the Engineering Report will assure a complete submittal and facilitate District review.

#### **3.1 General Information**

**(Submitted in Report Format)**

- 3.1.1 Project name and address
- 3.1.2 Legal description of property to be mined
  - a. Assessor's Parcel Number (APN)
  - b. Metes and bounds survey data
- 3.1.3 Applicant information
  - a. Property owner name, address, and phone number and proof of ownership
  - b. Mining operator legal entity and primary contact name, address, and phone number
  - c. Non-owner applicants: Property Owner's Letter of Authorization (See Section 8). A lease agreement may be substituted for the Letter of Authorization from the property owner.
- 3.1.4 Engineer of record
  - a. Name, address, phone number
- 3.1.5 Location maps for sand and gravel operation property
  - a. Adjacent land ownership, Assessor's parcel number, and current zoning
  - b. Aerial photograph showing property and proposed excavation limits
  - c. Geographic feature map
    - i. Watercourses and tributaries
    - ii. Streets, bridges, utilities, FLOOD CONTROL STRUCTURES located in a flood and erosion hazard zone within one mile of the proposed excavation
- 3.1.6 Site access
  - a. Description of access route to site to be used by District staff
  - b. Description of any restrictions to site access
  - c. Name and telephone number of person to contact for access notification

#### **3.2 Site Plan Requirements**

**(Submitted as Plan Sheets)**

- 3.2.1 Map and site information
  - a. North arrow, engineering scale, and legend
  - b. Easements and right-of-way
  - c. Utility alignments within the property limits
  - d. Property boundaries with description of property corner markers
- 3.2.2 Boundary survey
  - a. Required for all new permit applications
  - b. Boundary survey must comply with Arizona Board of Technical Registration current minimum standards for land boundary surveys.
- 3.2.3 Topographic mapping
  - a. General requirements
    - i. Spot elevations and contours shall comply with current national map accuracy standards for 2 foot contour mapping as published by the American Society for Photogrammetry and Remote Sensing, whether performed by aerial methods or ground surveys.
  - b. Contour lines – existing and proposed
    - i. Contour interval of no more than 2 feet

- c. Spot elevations
  - d. Location of on-site TEMPORARY BENCH MARK(S) -
  - e. Horizontal and vertical datum
    - i. Tie-in to FEMA or District floodplain map datum must be provided
    - ii. 1929 NGVD datum required for temporary benchmark
  - f. Mapping date and source
  - g. Tributaries and drainage paths
  - h. Registrant's name, address, and professional seal for topographic mapping
  - i. Site grading cross sections oriented perpendicular to the primary watercourse and spaced at no more than 500 feet intervals - show watercourse, excavation limits, side slopes, pit depth, stockpile areas, structures, 100-year water surface elevation
- 3.2.4 Mining operation information
- a. Maximum pit depth - existing and proposed
  - b. Maximum excavation limits - existing and proposed
  - c. Pit side slopes
  - d. Stationing, offset, or coordinates for excavation boundaries
  - e. Building(s) and processing equipment locations
  - f. Tailings, waste, stockpiling, and material storage locations
  - g. Location and type of fencing and access control features
  - h. Location of berms and screening features
- 3.2.5 Flood and erosion control structures
- a. Profile sheets showing all proposed flood and erosion control or engineered structures
  - b. Stationing for all linear structural measures
  - c. Engineering detail drawings for all structures
- 3.2.6 Phasing plan – a written description is required for COMPLEX MINING OPERATIONS
- a. Anticipated schedule for each phase – onset and closure
  - b. Boundaries for each phase
  - c. Locations of constructed features and excavation elements
  - d. Plan for final closure
- 3.2.7 Engineer of record seal, date and signature on all plan and profile sheets

### **3.3 Flood Hazard Zone Boundaries Map**

**(Submitted as Plan Sheets)**

- 3.3.1 North arrow and engineering scale
- 3.3.2 Property boundaries and dimensions
- 3.3.3 Topographic contour lines
- 3.3.4 Proposed and existing mine limits
- 3.3.5 Floodplain and floodway boundaries
  - a. New floodplain delineations
    - i. Floodplain limits
    - ii. Floodway limits
    - iii. Cross section locations, station labels, and water surface elevations
  - b. Existing effective floodplain delineation (District will supply data to applicant):
    - i. Floodplain limits
    - ii. Floodway limits
    - iii. Cross section locations labeled identically to District work maps
  - c. Floodplain delineations are required for all tributaries with 100-year flows greater than 50 cfs

- 3.3.6 Erosion hazard zone limit
  - a. Label indicating method used to delineate erosion hazard zone
  - b. Erosion hazard zone delineations are required for all tributaries with 100-year flows greater than 50 cfs
- 3.3.7 Locations of structural flood and erosion control measures that alter floodplain and erosion hazard zone limits
- 3.3.8 Engineer of record seal, date and signature

The Site Plan and FLOOD HAZARD ZONE BOUNDARY Map may be combined into a single map for simple mining operations when few or no structural flood control measures are proposed.

### **3.4 Reclamation Plan** (Submitted in Report Format with Plan Sheets)

The District intends to develop specific reclamation plan guidelines. Applicants should check with District staff to determine the status of the reclamation plan guidelines. At minimum, the reclamation plan shall include the following:

- 3.4.1 Written description of the reclamation plan, phasing, and proposed final condition of the site
- 3.4.2 Reclamation phasing plan including an anticipated timeline and projected schedule
- 3.4.3 Finished contours
- 3.4.4 Backfilled pit elevations
- 3.4.5 Cross section(s) showing finished side slopes and backfilled elevations
- 3.4.6 Location, stationing, and typical sections for permanent flood control structures (if any)
- 3.4.7 Bonding or financial assurance of compliance and reclamation
  - a. Documentation of compliance with Floodplain Regulations
  - b. Bonding plan data – description of performance assurance requirements (See Section 7)
- 3.4.8 Boundary survey
  - a. Required upon abandonment of mining operation
  - b. Boundary survey must comply with Arizona Board of Technical Registration current minimum standards for land boundary surveys.

Additional information on mining reclamation plan requirements is provided in Section 7.

### **3.5 Engineering Report** (Submitted in Report Format)

An Engineering Report is required for any sand and gravel floodplain use permit application that exceeds the minimum size, as defined in Section 5, or does not meet the streamlined permit conditions, as described in Section 5. Requirements for Engineering Reports are outlined in Section 6.

### **3.6 Certification** (Submitted in Report Format)

- 3.6.1 The standard engineer's certification form provided in Section 8 must be completed and sealed by an Arizona registered professional engineer. The certifying engineer shall have expertise in hydraulics, hydrology, sedimentation engineering, and river mechanics.
- 3.6.2 The permit applicant must certify that no mining will occur until all applicable regulatory and environmental permits have been obtained. The certification form is provided in Section 8.
- 3.6.3 Non-owner applicants must submit an Owner's Authorization Letter using the language provided in Section 8.
- 3.6.4 Applicant shall certify that legal access to the proposed mining operation is available.
- 3.6.5 If any submitted product contains both engineering and survey specific data such as property descriptions, metes and bounds courses, monumentation, control, or vertical and horizontal datums, the signature, seal and certification of each responsible registrant is required.

### **3.7 Notification**

**(To Be Done by the District)**

Per ARS 48-3610. 2, the District will advise any city or town in writing and provide a copy of any sand and gravel mining floodplain use permit application for sites within one mile of the boundary between the District's area of jurisdiction and that of the city or town.

## **Section 4: Permit Renewal Process**

### **Existing Sand and Gravel Operations**

Floodplain use permits for existing sand and gravel excavations in flood hazard zones require periodic renewal, as well as regular assurance of compliance with permit conditions. Existing sand and gravel excavations may be legal non-conforming, permitted, or out of compliance.

#### **4.1 Legal Non-Conforming (Grandfathered) Mining Operations**

- 4.1.1 Definition. Legal non-conforming (a.k.a., grandfathered) excavations are sand and gravel operations that were excavating materials prior to July 17, 1975 and that have been in CONTINUOUS OPERATION since that time. Specific conditions are described in Title 48, Chapter 21, Article 1 of the Arizona Revised Statutes and Article V, Section 505 of the *Floodplain Regulations for Maricopa County*.<sup>3</sup>
- a. Legal non-conforming status is not transferable to adjacent properties or land areas outside the excavation limits that existed on July 17, 1975, regardless of the current ownership of the adjacent land areas.
  - b. Expansion beyond the property parcel boundaries present on July 17, 1975 upon which excavation was occurring on July 17, 1975, is not a GRANDFATHERED activity and requires a new floodplain use permit. Excavation to a depth greater than that which existed on July 17, 1975 may not be a grandfathered activity and requires review by the District.
  - c. Continuous operation means that the operation was not discontinued for longer than twelve (12) consecutive months.
- 4.1.2 Assurance of Compliance. Owners of legal non-conforming excavations are required to submit documentation annually showing that the excavation has not extended beyond the legal non-conforming excavation limits and that it has been in continuous operation. Documentation shall consist of the following:
- a. Aerial photographs at a known scale from on or before July 17, 1975 and for the date of assurance, which show the mining limits on July 17, 1975 and at the date of assurance. Aerial photographs at identical scales are preferred. OR
  - b. Surveyed data sealed by an Arizona-registered land surveyor showing the excavation limits on July 17, 1975 and at the date of assurance. OR
  - c. A combination of aerial photographs and survey data that documents compliance. AND
  - d. Documentation of material excavation or sales that demonstrate continuous operation during the assurance period.
  - e. Assurance of compliance must include review and signature by the property owner or authorized representative.
  - f. Submittal of Assurance of Compliance Form 9-3 (See Section 9).

#### **4.2 Existing Permitted Sand and Gravel Excavations**

- 4.2.1 Permit Renewal. Sand and gravel floodplain use permits must be renewed every two or five years, depending on the stipulations of the original floodplain use permit.
- a. If the existing permitted mining plan has not been modified, annual assurance of compliance has been submitted, no MAJOR FLOODS have occurred, and no watercourse master plans have been adopted by the Board of Directors of the Flood Control District (Board), floodplain use permits may be renewed by providing the following information:

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<sup>3</sup> See also: *Pima County v. Cardi*, 123 Ariz. 424, 600 P.2d 37 (Ariz. App.1979).

- i. Letter signed by the property owner or an authorized representative, and the engineer of record that the mining operation is:
    - 1. In compliance with all conditions of the original permit, and
    - 2. In compliance with applicable watercourse master plans and/or AREA DRAINAGE MASTER PLANS, and
    - 3. River conditions are substantially unchanged since the original floodplain use permit was approved. Substantially unchanged means that topography, land use, vegetative cover, and channel morphology have not changed enough so that the 100-year water surface elevation has not changed by more than 0.5 feet, and the 100-year channel velocity has not changed by more than 10%.
  - ii. Field verification of permit compliance by District inspectors, and
  - iii. All applicable data listed in Section 3.
  - b. New permit guidelines apply (Section 5) where the previously approved mining plan has been or will be significantly modified, or where the mining operation has lost its legal non-conforming status.
  - c. A major flood is considered a significant modification to a previously approved mining plan. A major flood is defined as a flood that reaches, breaches, or otherwise enters the sand and gravel excavation, or a flood that causes lateral channel migration toward the excavation of more than 10 percent of the total pre-flood distance between the excavation and the primary channel bank.
  - d. If a major flood has occurred, the applicant must submit documentation demonstrating that no SIGNIFICANT CHANGES to the watercourse have occurred. Information on flood flow rates for specific watercourses may be obtained from the Flood Control District or the U.S. Geological Survey District Office in Tempe. Documentation must include the following:
    - i. Pre- and post-flood aerial photographs showing channel position, or
    - ii. Surveyed pre- and post-flood channel bank locations, and
    - iii. Pre- and post-flood surveyed channel and floodplain cross sections showing bank locations and a thalweg profile adjacent to the excavation.
  - e. Survey data must be sealed by an Arizona Registered Land Surveyor.
  - f. If a watercourse master plan has been adopted by the Board, the applicant must demonstrate compliance with the recommended management plan.
- 4.2.2 Assurance of compliance. Property owners or their authorized representative and owner/operators of permitted sand and gravel operations may be required to submit documentation annually showing that the excavation comply with the stipulated permitted conditions. Documentation may consist of the any of the following:
- a. Aerial photograph or survey data showing the present and permitted mining limits
  - b. Survey data sealed by a registered land surveyor showing:
    - i. Pit depth(s) for each actively mined part of the phasing plan
    - ii. Pit side slope for reclaimed areas

While reasonable attempts will be made by District inspectors to verify compliance of the mining operation with the floodplain use permit conditions, mine owners or operators may be required to provide additional or supplemental information as requested by the District.

### 4.3 Non-Complying Excavations

Sand and gravel mines that do not have legal non-conforming status, have not obtained a floodplain use permit, exceed the grandfathered areal extent, or no longer comply with the permitted conditions **must cease operations** and apply for a floodplain use permit, as described in Section 5 of these guidelines.

#### **4.4 District Inspection**

District inspectors may conduct semi-annual or post-flood inspections to assure compliance with permit conditions, or to identify flood related damages, as described in Section 9. Any conditions or restrictions on site inspections shall be clearly described on the floodplain use permit application, as well as a plan for allowing periodic access by District inspectors. A contact number for the mine supervisor must be provided with the permit application.

#### **4.5 Transfer of Floodplain Use Permit**

A floodplain use permit for a sand and gravel mining operation is not transferable without the District's written authorization. The new property owner and operator shall, upon application with the District, verify that they have read and understand, and shall stipulate in writing to the terms, conditions, and requirements of the existing permit approved by the District by submitting the transfer of permit agreement provided in Section 8. Assurance of compliance is required at the time of the permit transfer. If the new property owner or operator seeks to change or modify any previously approved permit conditions, they shall submit the requested changes to the District for review **prior to** commencing excavation and mining operations by the new owner or operator.

#### **Notes:**

1. Recent digital ortho-rectified aerial photography may be available from the Flood Control District of Maricopa County. Historical aerial photography is available from a variety of vendors, including the U.S. Geological Survey EROS Data Center website at <http://edc.usgs.gov/products/aerial/napp.html>.



## **Section 5: Permit Requirements**

### **New Sand and Gravel Operations**

Floodplain use permits for new sand and gravel excavations in flood hazard zones will be issued only after an engineering analysis is conducted and approved that documents that the District's floodplain management objectives and statutory regulations are met, except for the following two conditions:

#### **5.1 Minor Excavations**

A floodplain use permit is required for all sand and gravel excavations in flood and erosion hazard zones. However, if the cumulative volume of material to be excavated is less than 50 yd<sup>3</sup> over the life of the excavation AND the excavation within the floodplain or erosion hazard zone is SETBACK from all property boundaries a distance of no less than 25 times the pit depth, a floodplain use permit can be issued without an Engineering Report. Pit depth is measured as the difference between the average natural (pre-mining) ground elevation at the point vertically above the minimum elevation within the excavation.

- 5.1.1 MINOR EXCAVATIONS are subject to all the requirements identified in Section 4.
- 5.1.2 IF A MINOR EXCAVATION EXTENDS BEYOND THE CONDITIONS IDENTIFIED ABOVE, IT SHALL BE SUBJECT TO THE APPROPRIATE REVIEW REQUIREMENTS IDENTIFIED IN THIS SECTION.

#### **5.2 Streamlined Permit Application**

No detailed engineering analyses by the applicant are required if a new sand and gravel mine qualifies for a streamlined floodplain use permit. The streamlined permit application process applies if all of the following conditions are met:

- 5.2.1 An engineer certifies and documents that the proposed excavation meets recommended guidelines for sand and gravel mining in an approved Watercourse Master Plan for the watercourse in which the excavation is proposed, AND
- 5.2.2 If no floodplain, floodway, and erosion hazard zone delineation has been approved by the District for the watercourses impacted by the proposed mining operation, the applicant must complete those delineations as part of the permit application process, AND
- 5.2.3 Owner covenants to prevent and repair off-site erosion attributed to the mining operation, AND
- 5.2.4 A reclamation plan is provided, AND
- 5.2.5 An engineer certifies and documents that the proposed mining plan meets all of the applicable following conditions:

#### **5.3 Excavations Within the MAIN CHANNEL, Floodway or Erosion Hazard Zone (Figures 5-1 and 5-2):**

- 5.3.1 Setbacks. The excavation must be setback:
  - a. From the lateral property line – a minimum of 25 feet plus three times the difference between the natural ground elevation at the property line and the minimum elevation of the excavation (Figure 5-1), and
  - b. From the upstream property line, the setback is equal to the greatest of the following:
    - i. A minimum of 500 feet from any bridge or utility crossing, or
    - ii. A distance equal to 50 times the excavation depth (pre-excavation grade to excavation depth) at any point (excavation depth may vary laterally within the pit), or

- iii. If the excavation extends outside the erosion hazard zone, it must be set back from the upstream property line (Figure 5-2) a distance defined by a  $45^\circ$  angle from a line perpendicular to the channel centerline (equivalent to the commonly used 1:1 upstream contraction angle).
  - c. From the downstream property line, the setback is equal to the greatest of the following:
    - i. A minimum of 500 feet from any bridge or utility crossing, or
    - ii. If the excavation extends outside the erosion hazard zone, it must be set back from the downstream property line (Figure 5-2) a distance defined by a  $76^\circ$  angle from a line perpendicular to the channel centerline (equivalent to the commonly used 4:1 downstream expansion angle).
- 5.3.2 Depth of excavation. The depth of the excavation must be at or above natural channel thalweg elevation, as determined by the District and based on one of the following databases (in order of preference):
- a. District watercourse master plan study, or
  - b. FEMA floodplain delineation study minimum channel elevation, or
  - c. A baseline elevation established by the District or a profile provided by the applicant.
- 5.3.3 Excavation geometry. The mining excavation shall have the following geometry:
- a. Minimum of 0.5% pit bottom cross slope directed toward the channel centerline.
  - b. The excavated area must allow for a 3:1 slope from the buffer zone to the bottom of the excavation (Figure 5-1; minimum 25 ft.). For the streamlined permit, it is not acceptable to excavate vertically to the buffer zone and propose to backfill the excavation to achieve the required 3:1 slope.
- 5.3.4 Reclamation Plan. A reclamation plan is required for streamlined permit applications.

***Note: Deviation from approved slopes and setbacks will be cited as violations by District inspectors and may trigger the requirement for detailed engineering analyses.***

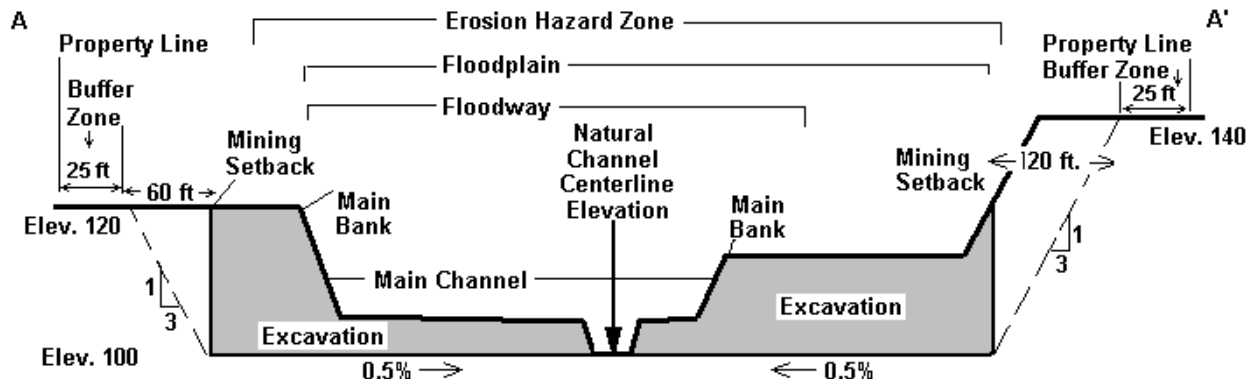


Figure 5-1. Main channel and floodway excavation geometry for streamlined floodplain use permits. Plan view is shown in Figure 5-2. This pit is 20 feet deep (Elev. 120 – Elev. 100). The shaded area marked “Excavation” is the area that can be mined under the streamlined permit process. Material may not be excavated from areas outside the shaded zone unless an engineering analysis is submitted.

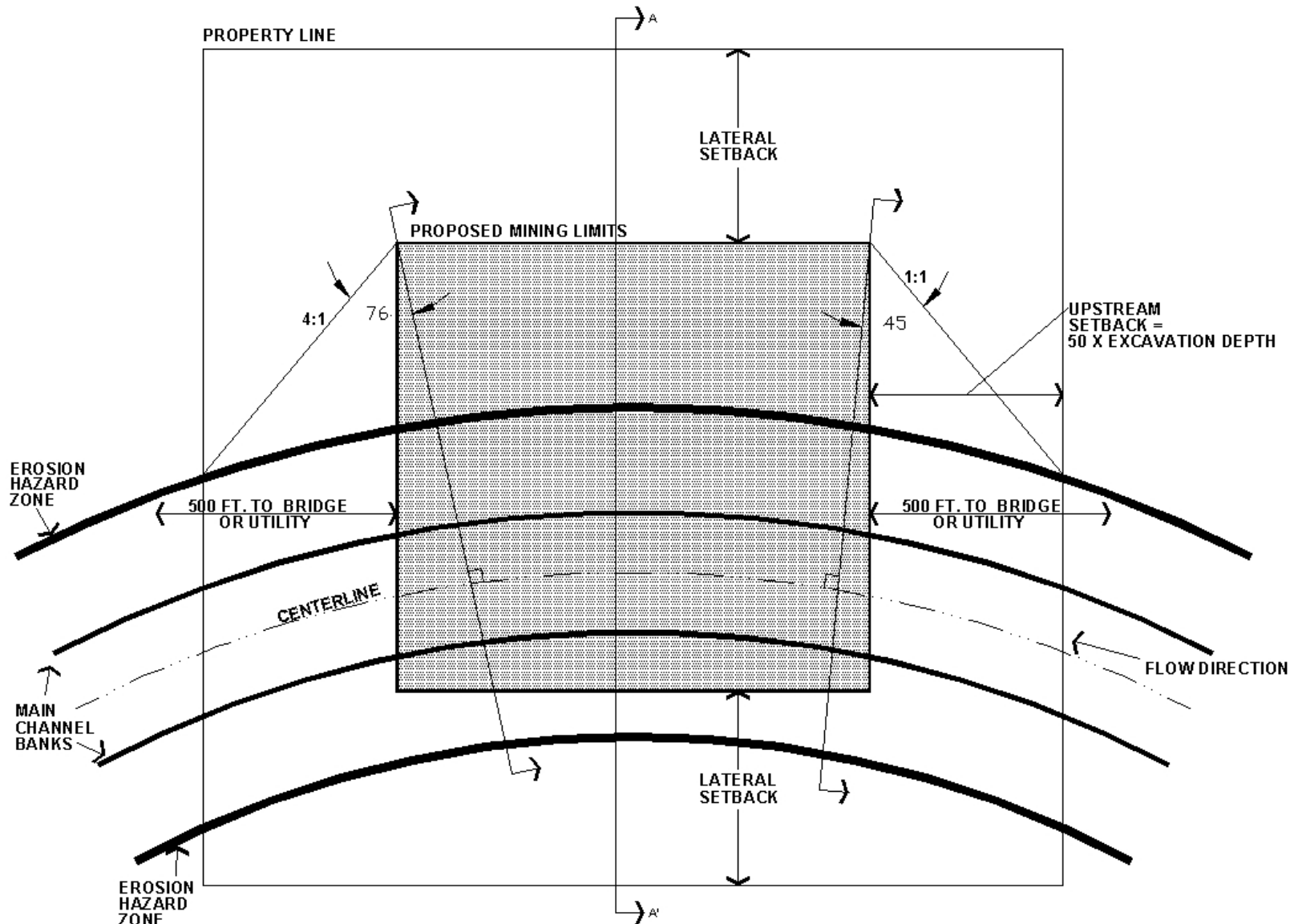


Figure 5-2. Upstream and downstream setbacks from property lines for excavations that extend outside the erosion hazard zone.

## 5.4 Excavations Entirely Outside the Main Channel, Floodway and Erosion Hazard Zone (Figure 5-3):

- 5.4.1 Setbacks. The excavation must be setback a minimum of:
- 25 feet from the erosion hazard zone, and
  - 100 feet from main channel bank, and
  - 500 feet from any bridge or utility crossing, and
  - Three times the difference between the natural ground elevation at the mining buffer line (25 ft. from the property line) and the minimum elevation of the excavation.
- 5.4.2 Depth of excavation. The maximum depth of excavation is determined by a 10:1 line drawn from the elevation of the toe of the main channel bank, as shown in Figure 5-3.
- 5.4.3 Excavation geometry. For the streamlined permit, it is not acceptable to excavate vertically to the buffer zone and propose to backfill the excavation to achieve the required 3:1 slope.
- 5.4.4 Reclamation Plan. A reclamation plan is required for streamlined permit applications (See Section 7).
- 5.4.5 Notes:
- Excavations within the floodplain are subject to inundation. If inundation occurs, mine owner covenants to repair breaches and restore main channel banks to pre-flood positions and condition, or construct engineered flood control structures.
  - If no approved erosion hazard zone exists, one shall be delineated based on an engineering analysis completed by the applicant, as described in Section 6.3.
  - Deviation from approved slopes and setbacks will be cited as violations by District inspectors and may trigger the requirement for detailed engineering analyses.

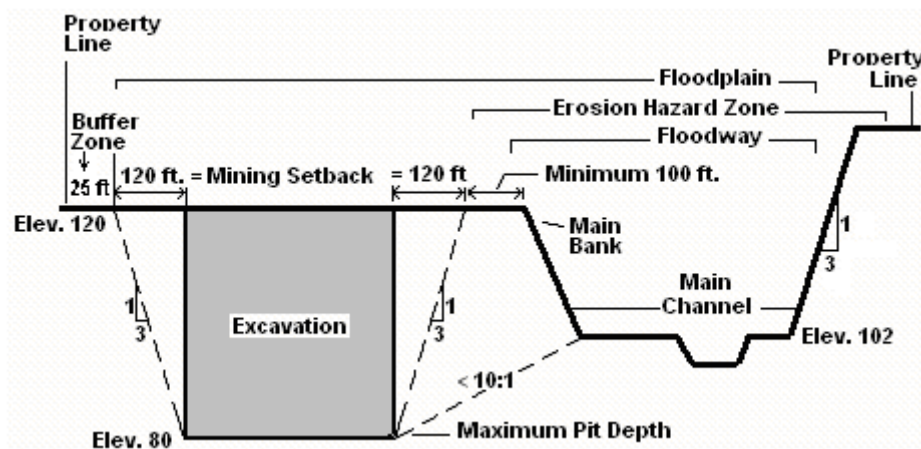


Figure 5-3. Floodplain excavation pit geometry for streamlined floodplain use permit. Pit is 40 ft deep.

## 5.5 Major Excavation Not Meeting Streamlined Criteria

Floodplain use permit applications for sand and gravel mining operations that do not qualify as minor excavations (Item #1 above) or do not meet the streamlined permit conditions, shall include an Engineering Report, as described in Section 6, in addition to the requirements of Sections 3 to 5.

## 5.6 Sand and Gravel Excavations Outside the Regulatory Floodplain and Erosion Hazard Zone

Floodplain use permits are not required for excavations that are located outside the regulatory floodplain limits and outside the erosion hazard zone. If the District has not approved regulatory flood and erosion hazard zones, see Section 6 for requirements for delineating the 100-year floodplain and erosion hazard

zone. In some cases, structural flood control measures may be constructed to remove the sand and gravel MINING SITE from the regulatory floodplain and erosion hazard zone, but such structures require detailed engineering analyses as described in Section 6.

## **Section 6: Engineering Report Requirements**

Detailed engineering analyses are required for sand and gravel mines located within the regulatory flood and erosion hazard zone that are not legal non-conforming operations or do not meet STREAMLINED CONDITIONS described in Section 5, as well as for those sites that will be protected by structural flood control measures. The Engineering Report shall be submitted with the floodplain use permit application and approved prior to any excavation in the regulatory floodplain or erosion hazard zone.

The Engineering Report should contain the following sections and types of analyses:

- General Information (Section 6.1)
- Floodplain Analysis (Section 6.2)
- Lateral Erosion Hazard Zone Analysis (Section 6.3)
- Structural Measure Design (Section 6.4)
- Impacts Analysis (Section 6.5)
- Local Drainage Analysis (Section 6.6)
- Statement Of Findings (Section 6.7)
- Documentation (Section 6.8)

A description of each of the objectives and typical components for the eight elements listed above is provided below. It is not necessary to provide all of the detailed analyses listed below in every case if site conditions dictate otherwise. For example, there is no need to perform floodplain and floodway modeling (Section 6.2) or floodplain impact analyses (Section 6.4.1) if the proposed site is located outside of all approved regulatory floodplains. Similarly, there is no need to determine an erosion hazard zone (Section 6.3) if engineered bank protection is proposed and approved. Applicants and their engineers are advised to coordinate closely with District reviewers to determine what types of analyses will be required during the preparation of and prior to preparing or submitting the Engineering Report for review.

### **6.1 General Information Section**

The objective of the General Information Section of the Engineering Report is to provide District reviewers with a basic description of the proposed mining activity, and enough information to identify potential regulatory issues. A General Information Section is required in every Engineering Report, regardless of site conditions. The following information should be provided in the General Information Section:

#### **6.1.1 General Project Information**

- a. Project name and address
- b. Applicant information – primary contact name, address, and phone number
  - i. Applicant legal entity
  - ii. Mine operator legal entity
  - iii. Property owner of record
  - iv. Engineer of record
  - v. Surveyor of record
  - vi. Mapping consultant
- c. Project Location
  - i. Legal description of property to be mined
  - ii. Location maps
    1. Adjacent land ownership, assessor codes, and current zoning

2. Location map at a regional scale (~1:63,360)
  3. Property ownership map showing assessor codes for adjacent parcels (~1:12000)
  4. Recent aerial photograph showing property and proposed excavation limits, photo date, and scale. A recent aerial photograph is defined as one which accurately depicts existing site conditions in the project reach and does not pre-date any on-site mining or major floods.
  5. The excavation and property limits should be plotted on a flood photograph, if available. Aerial photographs of some of the major watercourses during large floods are available from the District's GIS Department or from local commercial aerial photography vendors.
- iii. Geographic features map
    1. Watercourse and tributary names
    2. Municipal and jurisdictional boundaries
    3. Flood Hazard Zone Boundaries Map – See Section 3 for requirements
  - iv. Site access information
    1. Description of access route to site to be used by District staff
    2. Description of any restrictions on site access
    3. Name and telephone number of person to contact for access notification
- 6.1.2 Description of Mining Plan
- a. Proposed operation size
    - i. Property and excavation acreage
    - ii. Maximum expected depth of excavation
    - iii. Maximum expected volume of excavation
    - iv. Site plan – See Section 3 for site plan requirements.
  - b. Proposed phasing plan (include anticipated time line)
    - i. Phasing and expected timing of mining stages
    - ii. Phasing of flood protection structure construction
    - iii. Reclamation plan map – See Section 3 for requirements
- 6.1.3 Structure Inventory. List all structures within the floodplain and erosion hazard zone located within one mile upstream and downstream of the site, including tributaries. The inventory of structures shall include, but not be limited to the following:
- a. Roads – name, type, and ownership
  - b. Bridges – type, construction date, as-built plans, and ownership
  - c. Utilities – water, power, sewer crossings, canals – as-built plans and ownership
  - d. Landfills – existing or abandoned
  - e. Bank protection – type, extent, location, and as-built plans
  - f. Flood control structures – grade control, levees, dams, etc. – type, extent, and location
  - g. Floodplain development – subdivision names, zoning, and land use
  - h. Other existing sand and gravel mines – location and ownership
- 6.1.4 Existing Published Information. List published reports relevant to the project reach for the watercourse and its tributaries, including the following:
- a. Watercourse Master Plans
  - b. Floodplain Delineation Studies
  - c. Erosion Hazard Zone Delineation Studies
  - d. Previous sedimentation or erosion studies
  - e. Engineering reports for sand and gravel mines in adjacent reaches of watercourse
- A bibliography of published documents stored at the District library can be accessed on line at <http://www.fcd.maricopa.gov/Resources/Library.asp>.

## 6.2 Floodplain Analysis Section

The objectives of the FLOODPLAIN ANALYSIS SECTION of the Engineering Report are: (i) to document changes in the regulatory floodplain or floodway; (ii) to demonstrate that the proposed mining operation does not threaten public health, safety, and welfare; (iii) to show that the proposed mining activity has no offsite floodplain impacts; and (iv) to document compliance with all relevant FEMA requirements and the District's Floodplain Regulations. The following items should be addressed in the Floodplain Analysis Section:

- 6.2.1 **No Existing Floodplain Delineation.** If no District-approved floodplain delineation exists for the watercourse(s) impacted by the sand and gravel operation, new floodplain delineations must be prepared by the applicant. Guidelines for floodplain delineation studies and required documentation can be obtained from the following sources:
- a. Flood Control District of Maricopa County
    - i. Publications: [www.fcd.maricopa.gov/Resources/Publications.pdf](http://www.fcd.maricopa.gov/Resources/Publications.pdf)
    - ii. Information: Flood Delineation Branch: 602-506-1501
  - b. Arizona Dept. of Water Resources. *State Standards for Floodplain Management*. State Standards 1-97, 2-96, 3-94, and 9-02 relate to floodplain delineation. Available at [www.water.az.gov/adwr/Content/Publications/files/List0802.pdf](http://www.water.az.gov/adwr/Content/Publications/files/List0802.pdf)
  - c. FEMA: *Guidelines and Specifications for Flood Hazard Mapping Partners* (2002). Available at [www.fema.gov/mit/tsd/dlcgs.htm](http://www.fema.gov/mit/tsd/dlcgs.htm)
- 6.2.2 **Existing Floodplain Delineation.** If an approved floodplain delineation study is available for the watercourse, the most recent District-approved delineation must be used to evaluate potential floodplain and floodway impacts. The following elements should be included in the analysis:
- a. **Evaluation of channel conditions.** The engineer should document and certify that channel and floodplain conditions have not changed significantly since the approved floodplain delineation study was completed by submitting any or all of the following:
    - i. Comparative topographic cross sections of the channel and floodplain near the proposed mining site, or
    - ii. Comparative aerial photography of site and adjacent stream reaches, and
    - iii. Gauge records demonstrating no significant floods since the floodplain delineation was performedIf significant channel changes have occurred, the existing floodplain delineation will require revision to reflect existing conditions. Approval by the District must be obtained prior to proceeding.
  - b. **Evaluation of hydraulic model.** The engineer should evaluate and certify that the hydraulic model for the existing floodplain delineation can be used to adequately depict the proposed mining conditions. The following hydraulic information should be provided:
    - i. Revised hydraulic model. It may be necessary to add cross sections or make other changes to the existing floodplain delineation model so that pre- and post-project conditions can be compared in the hydraulic model. For example, a proposed mine may be located between cross sections used in the effective floodplain delineation model, and therefore would not be reflected in the model geometry unless new cross sections were added. The Engineering Report must list, describe and justify every change made to the existing floodplain delineation hydraulic model.
    - ii. Discharge. Changes in the discharge used in the hydraulic model are not permitted without prior approval by the District and by FEMA. FEMA will



require that a Letter of Map Revision be submitted and approved prior to use of a reduced discharge.

- iii. **Comparison Table.** A table comparing the existing floodplain delineation study and modified (pre-project) hydraulic model water surface elevation, depth, velocity, and channel area at all cross sections adjacent to the project must be provided.

6.2.3 Floodplain/Floodway Evaluation. The hydraulic model must be used to document the degree of impact on the regulatory floodplain and floodway by comparing pre- and post-project conditions. The engineer should perform sufficient modeling to document that the following conditions are met:

- a. **Floodway.** No increase in the regulatory floodway water surface elevation is allowable as a result of the proposed project or any related storage, stockpiling, processing, or other facilities.
- b. **Floodplain.** At minimum, changes in the water surface elevations and channel and overbank velocities at each cross section in the hydraulic model shall be documented for use in the Impacts Analysis (Section 6.4). Increases in the BASE FLOOD (100-YEAR) WATER SURFACE ELEVATION must be less than one foot, and must not increase on any property not owned by the applicant, unless the affected property owner provides a written statement consenting to the increase in water surface elevation.
- c. **Documentation.** Documentation shall include the following:
  - i. Cross section plots. Side-by-side plots of pre- and post-mining cross section topography, bank stations, ENCROACHMENT, effective flow boundaries, and roughness coefficients should be provided where any changes occur.
  - ii. Tabular data. Tables showing pre- and post-project water surface elevations, floodplain limits (start and end stations), channel velocity, overbank velocity, and maximum depth should be provided.
  - iii. Photographic data. Photographic evidence to support any changes in hydraulic roughness or other channel parameters.

Figure Under Development

*Figure 6-1. Illustration of Floodway, Floodway Fringe, Base Flood Elevation, and Regulatory Water Surface Elevation for a typical riverine floodplain.*

6.2.4 Floodplain/Floodway Revisions. In some cases, applicants may wish to revise the effective floodplain or floodway boundaries to reflect proposed flood control improvements or other changes in the floodplain. The following conditions apply:

- a. FEMA approval. Until revisions in the effective floodplain delineation are approved by FEMA as part of a Letter of Map Revision (LOMR), the District will regulate the floodplain using the most conservative floodplain delineation. Therefore, structural improvements intended to remove a mining site from the flood and erosion hazard zone do not remove the requirement for a floodplain use permit until the floodplain revisions are approved by FEMA.
- b. District approval. The District must approve any floodplain revisions prior to submittal to FEMA. During the review process, the District will consider the cumulative impacts of floodplain encroachment, channelization, or structural flood control.

NOTE: If a sand and gravel operation and its associated facilities are located completely outside all regulatory floodplains for watercourses with 100-year discharges greater than 50 cfs, the Floodplain Analysis Section can be omitted from the Engineering Report. However, a Floodplain Analysis Section is required if any of the following conditions apply: (i) the sand and gravel operation is going to be removed from the regulatory floodplain by structural measures; (ii) if the mining operation is located in a regulatory floodplain that has not yet been mapped; or (iii) if the channel or floodplain has been modified significantly since the floodplain delineation was completed. District staff are available to determine whether a Floodplain Analysis will be required.

### 6.3 Lateral Erosion Hazard Analysis

The objectives of the LATERAL EROSION HAZARDS ANALYSIS Section of the Engineering Report are: (i) to determine the limits of expected LATERAL EROSION; (ii) to demonstrate that the proposed mining operation cannot be impacted by lateral erosion; (iii) to document that the proposed mining operation meets all relevant FEMA and District regulations for activity within the watercourse; and (iv) to document that the proposed plan protects public health, safety, and welfare. The Erosion Hazards Analysis Section must include an evaluation of potential lateral channel erosion for all watercourses that impact the project site.

6.3.1 Watercourses with District-Approved Erosion Hazard Zones (EHZ). The following options are available for streams with approved EHZ:

- a. Use the approved EHZ. Use of the approved EHZ will facilitate permit approval.
- b. Modify the approved EHZ. An approved EHZ may be modified under the following conditions:
  - i. **Correct errors.** If errors in the original EHZ are identified and can be clearly shown to be errors by detailed engineering and GEOMORPHIC analyses, the EHZ may be revised accordingly. The District will not consider subjective reinterpretation of the results and conclusions from previous EHZ delineations as sufficient proof of an error.
  - ii. **Perform more detailed analysis.** Some District-approved EHZ were delineated using reconnaissance-level techniques, while others were based on detailed engineering and geomorphic analyses. More detailed, site-specific engineering, geomorphic, or geotechnical analyses that exceed the level of detail used in the approved EHZ study may be submitted to justify modification of approved EHZ. The more detailed analyses or data must clearly demonstrate that different

conclusions regarding the approved erosion hazard zone delineations are justified. The applicant bears the burden of proof for any modification of an approved EHZ.

- iii. **Demonstrate compatibility with District planning documents.** The applicant must demonstrate that any changes to an approved EHZ are compatible with the goals and management objectives of any approved or draft watercourse master plan or area drainage master plan, as well as with the technical data from any approved floodplain delineation study.
- iv. **Construct structural measures.** Properly designed structural erosion control measures can modify an EHZ. Specific requirements for structural measures are outlined in Section 6.4 below.

**6.3.2 Watercourses without Erosion Hazard Zones (EHZ).** The following options are available for streams without a District-approved erosion hazard zone:

- a. Provide structural erosion control. Engineered erosion control may be constructed in lieu of delineating and locating the mining operation outside the EHZ. Specific requirements for structural measures are outlined in Section 6.4 below.
- b. Delineate the erosion hazard zone. More detailed information on delineating erosion hazard zones is provided in the District publication EROSION HAZARD ZONE DELINEATION AND DEVELOPMENT GUIDELINES. The following information applies to delineation of erosion hazard zones for a sand and gravel floodplain use permit application:

**i. General information**

- 1. Philosophy. The regulatory erosion hazard zone consists of the channel and floodplain area likely to be eroded by a “typical” series of floods over a 60 to 100 year period, including a 100-year flood, as well the natural channel movement due to geomorphic processes such as MEANDER MIGRATION or CHANNEL AVULSION. The erosion hazard zone is not intended to be limited to the distance the main channel banks might move in a single design flood. Therefore, the erosion hazard zone should be delineated based on consideration of a typical flood series over a long-term period.
- 2. Resources. Information on delineating erosion hazard zones can be obtained in the following documents:
  - a. Flood Control District of Maricopa County. *Draft Erosion Hazard Zone Delineation and Development Guidelines*.
  - b. Arizona Department of Water Resources. *State Standard 5-96 – Requirement for Watercourse System Sediment Balance*.
  - c. FEMA. *Riverine Erosion Hazard Area Mapping Feasibility Study* (1999).
- 3. SEDIMENT TRANSPORT MODELING. In general, information provided by sediment transport computer models such as HEC-6 is not directly relevant to delineating lateral erosion hazard zones, although such modeling sometimes can be used to evaluate impacts of flood control alternatives, identify trends in sediment movement along a watercourse reach, or to predict reaches with SEDIMENT DEFICITS. More detailed information on computer sediment transport modeling is provided in Section 6.5.3.
- 4. Verification. Historical and field data are required to support any new EHZ delineation. In general, if historical or field data indicate that lateral erosion will occur, any contrary results from mathematical or

theoretical analyses will be considered subordinate to verified historical and field data on stream behavior.

**ii. Required analyses.** At minimum, an erosion hazard zone analysis prepared in support of a sand and gravel mining floodplain use permit may include some or all of the following elements (\* indicates required elements):

1. Engineering analyses\*
  - a. Bank stability assessment\*
    - i. ALLOWABLE VELOCITY/TRACTIVE FORCE/TRACTIVE STRESS
  - b. Channel avulsion potential\*
    - i. Overbank flow DEPTH-VELOCITY-FREQUENCY ASSESSMENT
    - ii. Identification of potential overbank flow paths
  - c. STREAM BED STABILITY ASSESSMENT\*
    - i. General and local scour equations
    - ii. Equilibrium channel slope
    - iii. Armoring potential
  - d. SEDIMENT CONTINUITY MODELING\*
    - i. Sediment yield (supply)
    - ii. Sediment transport capacity
    - iii. Sediment deficit/surplus analysis
  - e. Geotechnical analyses
    - i. Slope stability analysis
    - ii. Resistance analysis
2. Geomorphic analyses\*
  - a. Field investigation\*
    - i. Main channel – evidence of erosion or stability
    - ii. Floodplain – evidence of erosion, deposition, AVULSION
    - iii. Comparison to adjacent reaches
  - b. Bank stability assessment\*
    - i. Identification of LATERAL EROSION MECHANISMS
    - ii. Bank characteristics – erodibility
    - iii. Floodplain characteristics – avulsion potential
  - c. Mapping of geomorphic surfaces\*
    - i. Delineate channels, floodplains, terraces and uplands
    - ii. Delineate HOLOCENE and pre-Holocene surfaces
  - d. Quantification of historical channel changes\*
    - i. Lateral channel change
      1. Maximum single event channel movement
      2. Maximum long-term channel movement
    - ii. Vertical channel elevation changes
  - e. Stream classification analysis
  - f. Longitudinal profile analysis
  - g. Channel pattern analysis
    - i. MEANDER GEOMETRY EQUATIONS
    - ii. Channel pattern evolution
    - iii. HYDRAULIC GEOMETRY/REGIME EQUATIONS

More detailed information and technical references regarding these types of erosion hazard analyses can be obtained from the District's *Draft Erosion Hazard Delineation and Development Guidelines*, as well as from the citations listed above

or from reports prepared for District-approved erosion hazard studies on file in the District library cited in Section 11.

NOTE: A Lateral Erosion Hazard Analysis Section is not required in the Engineering Report if the proposed sand and gravel operation is located on a stream reach that has an existing District-approved erosion hazard zone delineation for that reach, or if the entire sand and gravel operation is located outside the regulatory floodplain and erosion hazard zone.

## **6.4 Structural Measure Design**

The objective of the Structural Measure Design Section of the Engineering Report is to demonstrate that any structural measures proposed in support of the mining operation are designed according to standard accepted procedures, will withstand flooding and erosion, meet all relevant FEMA and District regulations for activity within the floodplain, and will protect public health, safety, and welfare. The following criteria will be used to review and evaluate structural flood control measures:

- 6.4.1 District Design Guidelines. Hydraulic design criteria for channels and *flood control structures* adopted by the District are specified in the *Drainage Design Manual for Maricopa County – Hydraulics*. Additional structural mitigation measures are described in the following documents:
  - a. Effects of In-Stream Mining on Channel Stability (Li et. al., 1989)
  - b. Sand and Gravel Mining Guidelines (Boyle Engineering, 1980)
  - c. Technical Review Guidelines for Gravel Mining Activities (Wright Water Engineers, 1987)
- 6.4.2 FEMA Requirements for Flood Control Structures. If the applicant intends to revise the FEMA-approved floodplain or floodway delineation, FEMA criteria outlined in 44 CFR Parts 60, 65, and 70 must be used in addition to District guidelines to assure FEMA acceptance of the revision.
- 6.4.3 General Design Guidelines for Flood Control Structures. The District will evaluate proposed flood control structures using the following general guidelines:
  - a. Structures must withstand the design event (Q100 or as specified in WCMP).
  - b. Structures must function for the projected life of the excavation.
  - c. Structures must be incorporated into the reclamation plan.
  - d. Structures must be maintained and inspected by the owners.
  - e. Structures should have no adverse impact on adjacent properties (Section 6.5)
- 6.4.4 Specific Design Guidelines for Flood Control Structures. The District will evaluate the design of proposed flood control structures using the following specific criteria:
  - a. Channel conditions. Because structures located within the EHZ may be exposed by lateral erosion, they must be designed using hydraulic data for the main channel. Where the main channel is wide and complex, the maximum rather than the average channel depth and velocity should be used as the basis of design.
  - b. Toe-down. Structures should be toed-down below the 100-year depth of scour plus the long-term scour depth. Structures located within the EHZ should be toed down below the main channel scour depth.
  - c. Lateral tie-in. Structures should be laterally tied in to stable, non-erosive surfaces to prevent flanking.
  - d. Freeboard. Freeboard requirements for structures are listed in the *Drainage Design Manual for Maricopa County – Hydraulics*.

- 6.4.5 Documentation. Engineering designs should be thoroughly documented by computations, design drawings, typical sections, standard details and specifications included in the Engineering Report appendixes.

## 6.5 Impacts Analysis

The case histories documented in Section 11 describe disastrous and costly flood damages linked to in-stream sand and gravel excavations. The objective of the Impacts Analysis Section of the Engineering Report is to demonstrate that a proposed mining operation does not adversely impact adjacent properties or nearby structures, to document that relevant floodplain regulations are met, and to demonstrate that the proposed project poses no threats to public health, safety, and welfare. In general, the proposed mining operation should have no adverse impacts or changes in floodplain characteristics on adjacent properties without written permission of all affected landowners and approval by all relevant public agencies.

- 6.5.1 Regulatory Floodplain/Floodway Impacts. Hydraulic modeling of the pre- and post-project channel and floodplain conditions must be submitted and approved by the District to document the following:

- a. **Floodplain.**
  - i. Changes in the base flood (100-year) water surface elevation must be less than one foot within the property limits.
  - ii. No changes in the base flood (100-year) water surface elevation may occur on adjacent properties.
- b. **Floodway.**
  - i. No changes in the regulatory floodway elevation are permitted, either within or adjacent to the proposed project limits.

- 6.5.2 Stream Stability and Sedimentation Impacts. Engineering analyses must be submitted to document that no adverse impacts occur on adjacent properties due to the proposed sand and gravel excavation. It is recommended that the applicant's engineer meet with District staff prior beginning any analyses to discuss and review the engineering methodologies to be used to evaluate sedimentation impacts. References describing the methodologies and procedures outlined below are provided in Section 11 of these guidelines.

- a. **Streamlined review criteria.** Based on findings documented in previous District studies, mining activities in the flood and erosion hazard zone will be considered to have no significant sedimentation impacts if all of the following conditions are met:
  - i. 10-year floodplain –
    1. No activity within, or alteration of, the 10-year floodplain.
    2. No change in 10-year width, depth, velocity or water surface elevation.
  - ii. 100-year floodplain –
    1. Increase in water surface elevation and depth of less than 0.1 foot.
    2. Increase in channel or overbank velocity less than 10% and/or 1ft/s.
  - iii. Erosion hazard zone –
    1. The excavation is located entirely outside the erosion hazard zone, or
    2. The excavation is protected from lateral erosion or capture of the main channel by engineered flood control structures.
  - iii. Reclamation plan –
    1. The reclamation plan prevents inundation of the abandoned excavation during a 100-year flood (or the return period specified in an applicable watercourse master plan), or includes structural measures to limit erosion caused by pit inundation.

- b. **Sedimentation impacts from floodplain encroachment or channelization.** The engineering analysis must address each of the following types of sedimentation impacts:
- i. Deflection scour. Deflection scour occurs on a stream bank when the channel or floodplain alignment is changed causing changes in flow direction, or where only one bank is protected, thus limiting the available sources of sediment in the reach. The following conditions can lead to reflective scour:
    1. Change in the main channel alignment
    2. Change in the overbank flow path alignment
    3. Concentration of overbank flow
    4. Increase in percentage of flow carried in the main channel due to overbank encroachment or deflection
    5. Protection of only one channel bank
    6. Severe contraction of the channel or floodplainThe evaluation of potential deflection scour should account for development of adverse channel alignment caused by exposure of proposed flood control structures following long-term channel movement. Channelization or structural measures located within the EHZ should be designed with smooth transitions.
  - ii. Contraction scour. Floodplain encroachment increases flow velocity and depth, which results in increased channel bed erosion and sediment transport capacity. Hydraulic data from the pre- and post-project hydraulic models should be used in conjunction with an approved sediment transport function to demonstrate that the proposed mining plan does not increase scour, erosion, or deposition on any adjacent property.
- c. **Sedimentation impacts from pit capture or inundation.** The engineering analysis must address each of the following types of sedimentation impacts:
- i. Upstream scour and degradation. Upstream scour occurs when floodwater enters a sand and gravel mine excavated below the grade of the surrounding floodplain or channel. Upstream scour consists of two primary elements: (1) a HEADCUT that migrates upstream as floodwater falls into the pit and erodes the upstream face of the excavation, and (2) LONG-TERM DEGRADATION as the watercourse adjusts to a new base level provided by the bottom of the excavation. More detailed descriptions of headcut and degradation processes are provided in the technical references provided in Section 11. The engineering analysis of upstream scour should include the following elements:
    1. Headcut movement during the design hydrograph.
      - a. Headcut movement during the design hydrograph shall be limited to the property owned by the mining operator, unless all potentially affected adjacent property owners provide written consent to allowing their property to be impacted by a headcut.
      - b. Headcut modeling procedures are provided in Li et. al. (1989, "The ADOT Report").
    2. Headcut movement during other flow events. The rate of headcut migration can be slowed by rapid filling of the excavation by floodwater. Therefore, headcut movement may be more severe during a long-duration, low magnitude event than during the design event. The engineer should document whether the design event or another flow event controls the headcut migration process by investigating headcut migration under various inflow hydrographs.
    3. Headcut movement during multiple flow events (long-term degradation). Unless sediment removed from the upstream channel during headcut migration is replaced, and the pre-flood channel conditions are restored,

the headcut will continue to deepen and extend upstream during subsequent floods. In effect, the bottom of the excavation will become the stream's new base level to which the upstream reaches will adjust. Furthermore, in most mining scenarios, sediment deposited in the excavation during a flood will be mined, returning the excavation depth to the pre-flood depth and establishing a condition favorable to continued headcut formation. Therefore, the engineering analysis should document the potential headcut migration and characteristics over the design life of the excavation. The engineer should model the potential upstream headcut and degradation over a series of floods, with consideration of likely post-flood mining practices, and incorporation of the proposed reclamation plan.

4. Headcut modeling notes:
  - a. Headcutting is affected, but not prevented, by a high water table. The technical references listed in Section 11 document numerous instances of headcut formation and degradation on perennial streams. The engineer should not assume that headcut depth is limited to the water table. Where the engineering analysis relies on the depth of the water table, the engineer should provide documentation regarding the historical and future stability of water table elevations.
  - b. Headcut analysis, as described above, is required for any excavation located in the EHZ or that is subject to capture by the main channel.
  - c. Headcut analysis for an excavation located outside the EHZ, but within the floodplain, should be based only on the part of the hydrograph intercepted by the excavation.
  - d. No headcut analysis is required for excavation not subject to capture by the main channel or not subject to 100-year flood inundation.
  - e. In general, headcutting analyses should show that long-term degradation will occur upstream of in-stream excavations unless structural erosion control measures are provided.
- ii. Downstream degradation. Downstream degradation is caused when sediment is trapped within an excavation, and sediment-deprived water flows out of the excavation into downstream reaches. Downstream degradation can be estimated using procedures outlined in technical references listed in Section 11.
  1. ADOT Procedure. The methodology described in Li et. al. (1989; Volume II, Chapter X, p. 72-86) is recommended for most applications.
  2. Sediment modeling. If the excavation does not intercept the entire active channel and floodplain, computer sediment models of downstream degradation may significantly underestimate downstream impacts. The engineer should use alternative methods, such as the ADOT long-term procedure, to evaluate potential downstream scour.
- iii. Channel deflection or realignment. If a sand and gravel excavation is subject to capture by lateral erosion or inundation by FLOODWATERS, the engineer should demonstrate the following:
  1. Floodwater cannot exit the flooded excavation. In this case the flooded excavation will be a slackwater zone subject only to deposition and ponding.



2. The proposed excavation design accounts for potential inundation. In this case the engineer must demonstrate that floodwater will maintain its pre-capture characteristics and conditions, and that flow will exit the mining site in a manner that will not affect adjacent stream reaches, will not enter the main channel or floodplain at a skew or cause a deflection of floodwater toward an adjacent stream bank.
  - d. **Cumulative impacts analyses.** The District will consider the effect on the river system, adjacent properties, and public infrastructure if all landowners along the watercourse were allowed the same degree of impact on the river system as the permit applicant. On streams lacking a watercourse master plan, the District may require a cumulative impacts analysis as part of the floodplain use permit application Engineering Report.
- 6.5.3 **Guidelines for Use of Computer Sediment Transport Modeling.** In the past, many engineers have attempted to evaluate the impacts of sand and gravel mining using sediment transport computer models, such as the U.S. Army Corps of Engineers' HEC-6 model. However, the District's experience with such models is similar to that of the American Society of Civil Engineers (ASCE, 1998, Journal of Hydraulic Engineering, p. 881), which concluded that existing computer models have numerous deficiencies, including the inability to accurately predict lateral bank erosion. Therefore, sediment transport computer modeling is not required to support most floodplain use applications and should be used with caution according to the following guidelines:
- a. **Model assumptions.** The engineer should explicitly address in the Engineering Report all the limitations and assumptions typically in the computer model user's manual to assure that model is being applied appropriately. Typical limitations and assumptions of sediment transport computer models for stream conditions in Maricopa County include the following:
    - i. Inability to simulate the magnitude of lateral erosion known by historical data
    - ii. Inability to simulate lateral erosion by avulsion processes.
    - iii. Inability to simulate the effects of soil cohesion, vegetation, or local variations in soil characteristics on transport rate and erodibility.
    - iv. Inability to simulate natural floodplain processes, such as simultaneous overbank deposition and channel scour (or vice-versa).
    - v. Inability to simulate sediment transport where two-dimensional flow, braided flow, or split flow occurs.
    - vi. Inability to simulate transport of large diameter sediment sizes, such as cobbles, which are known by field evidence to be transported.
    - vii. Inability to simulate the effects of base level adjustments such as headcutting.

The engineer should determine and certify whether and how any of these or other model limitations affect the proposed application or impact analyses.
  - b. **Modeling Approach.** The engineer should describe the proposed modeling approach. Specifically, the engineer should demonstrate how the localized impacts of the pit will be analyzed using the selected computer model(s), and how the model algorithms will simulate locally variable sediment transport characteristics across individual cross sections, between adjacent cross sections, and within impacted and non-impacted portions of the floodplain and channel, as well as how model results will be interpreted for assessing sedimentation impacts.
  - c. **Selection of flood hydrographs.** If sediment transport models are used, the following range of hydrographs should be modeled:
    - i. Design event. Typically, a 100-year hydrograph is used. However, the engineer should determine whether another event could have more significant impacts than the 100-year event and should be considered as the design event in addition to the 100-year event.

- ii. Flood series. Modeling should be performed using an assumed series of multiple small and large floods that attempts to simulate long-term channel responses to the expected range of floods that would occur over a 100-year period.
  - iii. Long-duration flow. Flow duration is often more important than peak discharge in determining channel changes. Some engineers have attempted to predict expected long-term channel response by modeling a constant bankfull discharge over durations of up to several years.
- d. **Verification.** The engineer must provide information that verifies the results of the sediment transport computer model. The verification information should include the following:
  - i. Water surface elevations. The step-backwater hydraulic modeling component of the sediment transport model should be verified by comparing water surfaces established by the appropriate floodplain delineation study with those from the sediment transport model.
  - ii. Lateral erosion. Lateral erosion predicted using the computer model should be comparable to magnitude of single event and long-term lateral erosion identified from historical data.
  - iii. Scour estimates. The magnitude of single event scour predicted by the sediment transport computer model should be comparable to channel and long-term scour estimates computed using equations outlined in publications listed in Section 11. In addition, long-term scour predicted by the sediment transport computer model should be comparable to long-term scour estimated from historical topographic information and field data.

If the computer model results cannot be verified or cannot simulate known historical channel responses, the modeling approach should be modified or abandoned.
- e. **Interpretation of model results.**
  - i. Trend analysis. In general, sediment transport modeling results are best interpreted as order-of-magnitude indications of the potential trend of channel behavior, rather than precise estimates of the actual response.
  - ii. Comparative analysis. Sediment transport modeling can be effectively used to compare the relative predicted pre- and post-project trend of response, or to compare the relative response of various flood control alternatives.
- f. **Coordination with District review staff.** To facilitate the permitting process and to prevent any wasted effort and funds by permit applicants, engineers are strongly advised to coordinate any computer modeling efforts with District staff prior to undertaking the modeling effort and prior to submittal of results.

## 6.6 Local Drainage Analysis

The objective of the Local Drainage Analysis Section of the Engineering Report is to demonstrate that local runoff flowing into and out of the project area is addressed. Local runoff should be safely conveyed around the mining operation or accounted for by engineering measures. The District regulates flood and erosion hazard zones for all watercourses with 100-year discharges greater than 50 cfs.

Specific drainage criteria for development are outlined in the following documents:

- Drainage Regulations for Maricopa County
- Floodplain Regulations for Maricopa County

Both of these documents are available at [www.fcd.maricopa.gov](http://www.fcd.maricopa.gov).



## **6.7 Statement of Findings**

The objective of the Statement of Findings Section of the Engineering Report is for the engineer of record to provide a concise summary of the results of each analysis, a definitive statement that all relevant County regulations are met, and that no adverse flood or erosion impacts are likely to occur to any off-site property due to the proposed plan. The Engineering Report Statement of Findings Section must include a definitive statement for each of the following areas:

- 6.7.1 Floodplain standards have been satisfied
  - a. FEMA
  - b. Local
- 6.7.2 Floodway standards have been satisfied
  - a. FEMA
  - b. Local
- 6.7.3 No offsite impacts will occur
  - a. Upstream
  - b. Downstream
  - c. Tributaries
  - d. Local drainage
  - e. Structures
  - f. Groundwater
  - g. Stream form and function
- 6.7.4 Need for structural flood control has been addressed
  - a. Vertical scour and degradation
  - b. Lateral erosion
- 6.7.5 A reclamation plan is provided
- 6.7.6 Compliance with regulations and guidelines
  - a. FEMA
  - b. Flood Control District of Maricopa County
  - c. Maricopa County Watercourse Master Plan
  - d. All State and Federal agency permits will be obtained prior to mining

## **6.8 Documentation**

Thorough documentation of the engineering analyses used in the Engineering Report will facilitate the District's review. The following types of documentation are required:

- 6.8.1 Engineering Calculations
  - a. Calculation worksheets
  - b. Spreadsheets (digital version) with explanation of equations used in spreadsheet
  - c. References for all equations used
  - d. References for all methodologies used
- 6.8.2 Computer Modeling
  - a. Input files (digital version required)
  - b. Output files
- 6.8.3 Engineering Design
  - a. Typical sections and details
  - b. Plan, profile, and stationing
  - c. Supporting calculations
  - d. Design standards reference
- 6.8.4 Soils/Geotechnical Analyses

- a. Sampling location map
  - b. Laboratory results
- 6.8.5 Survey
- a. Field notes
  - b. Description of datum and coordinate system
- 6.8.6 Bibliography
- a. Technical references used
  - b. Mapping sources
  - c. Previous studies
  - d. Floodplain delineation studies
  - e. Watercourse master plans
  - f. Area drainage master plans

Note that engineering analyses may require revision after a major flood to reflect changes in watercourse conditions.

## **Section 7**

### **Reclamation Plans**

Reclamation plans are required for all sand and gravel operations that require a floodplain use permit. The District intends to develop specific reclamation plan guidelines for sand and gravel mining operations located in flood and erosion hazard zones. Applicants should check with District staff to determine the status of the reclamation plan guidelines.

Until the District reclamation guidelines are completed, the following interim reclamation plan guidelines are recommended:

1. Proposed finished contour elevations should be provided for the mining site after excavation is completed.
2. Proposed minimum elevations for any backfilled excavations should be clearly marked.
3. The location, stationing, and typical sections for permanent flood control structure should be shown and detailed on the reclamation plan sheets.
4. Cross section(s) showing finished side slopes and backfilled elevations should be provided.
5. A description of the reclamation plan phasing should be provided, including an anticipated timeline and projected schedule.
6. Bonding or financial assurance of compliance and reclamation should be provided that includes:
  - a. Documentation of compliance with Floodplain Regulations
  - b. Bonding plan data – description of performance assurance requirements
7. Boundary survey
  - a. Required upon abandonment of mining operation
  - b. Boundary survey must comply with Arizona Board of Technical Registration current minimum standards for land boundary surveys.

In general, the reclamation plan should demonstrate that the final state of the excavation will be stable, will not result in increased flood and erosion hazards on adjacent properties, and will not be subject to flood and erosion damage. Reclamation plans should be developed considering the ultimate future use of the post-mining property, revegetation to natural conditions, and public safety.

## **Section 8**

### **Certification Forms**

Certifications may be required to support the Floodplain Use Permit application, depending on the specific conditions of the mining location, as indicated in Table 8-1. The following certification forms are provided in this section:

- Form 8-1: Certificate of Agency Permit Compliance
- Form 8-2: Property Owner's Letter of Authorization
- Form 8-3: Transfer of Floodplain Use Permit Agreement Form
- Form 8-4: Assurance of Compliance Form – Legal Non-Conforming Operations
- Form 8-5: Certification of Compliance Letter – Renewal of Existing Floodplain Use Permit

<b>Table 8-1. Certification Forms</b>					
<b>Type of Floodplain Use Permit Application And Site Characteristics</b>	<b>Form 8-1</b>	<b>Form 8-2</b>	<b>Form 8-3</b>	<b>Form 8-4</b>	<b>Form 8-5</b>
Legal Non-Conforming Mining Operation	<b>R</b>	<b>X</b>	<b>NA</b>	<b>R</b>	<b>NA</b>
Permit for New Mining Operation	<b>R</b>	<b>R</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
Permit Renewal for Existing Mining Operation	<b>R</b>	<b>X</b>	<b>X</b>	<b>NA</b>	<b>R</b>
Renewal and Amendment of Existing Mining Permit	<b>R</b>	<b>X</b>	<b>NA</b>	<b>NA</b>	<b>R</b>
<b><u>Codes</u></b>					
R = Form is required                      NA = Not applicable					
NR = Form is not required              X = Form may be required, contact Floodplain Administrator					

Applicants may not modify the content of the certification forms without prior authorization of the FLOODPLAIN ADMINISTRATOR. Notary service is available at the District main office (2801 W. Durango St., Phoenix, AZ 85009) for forms that require notarization.

The fees for permitting, renewal and amendments to floodplain use permits for sand and gravel extraction shall be as approved by the Board of Directors of the FCDMC.

## Certification of Agency Permit Compliance

Form 8-1

This is to certify that no mining will occur at the site indicated in this floodplain use permit application until all applicable environmental and regulatory permits have been approved and have been obtained from local, state, and federal agencies, including, as applicable, the U.S. Army Corps of Engineers Section 404 Permit, Arizona Department of Environmental Quality 401 Certification, National or Arizona Pollutant Discharge Elimination System (NPDES/AZPDES), Arizona State Mining Inspector, and Maricopa County Environmental Services Air Quality and Construction general permits. Copies of all applicable permits will be submitted to the District upon issuance and shall be made part of the floodplain use permit file.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name/Title

\_\_\_\_\_  
Date

Affix Notary's Seal:

Note: As directed by 44 CFR 60.3(a), the District requires documentation that an applicant for a floodplain use permit is in compliance with applicable permits from other local, state, and federal agencies. The District will approve a conditional floodplain use permit if proof of application for other agency permits is provided with the floodplain use permit application. However, no excavation in floodplains and erosion hazard zones may be conducted until documentation of approval of all relevant permits from other agencies has been received and acknowledged by the District. A list of agency permits and internet links is provided on the District's web page at [www.fcd.maricopa.gov/permitting](http://www.fcd.maricopa.gov/permitting).



## Property Owner's Letter of Authorization

Form 8-2

If the applicant for the floodplain use permit is anyone other than the property owner, the property owner shall submit a letter authorizing the applicant to conduct the proposed activities on their land, and giving the applicant permission to apply for the appropriate permits. The authorization letter shall include the following language:

*The property owner acknowledges that they will not divert, retard or obstruct the flow of water in any watercourse without written authorization from the District, and shall be bound by any stipulations stated in the floodplain use permit, including no adverse impact on adjacent properties, no hazard to life and property or to the watercourse, any stipulated requirement for bonding, and site reclamation plans.*

Documentation of the proposed mining site ownership must be attached to the Letter of Authorization. A lease agreement with proof of ownership may be submitted in lieu of the Property Owner's Letter of Authorization if and only if the lease contains the language noted in italics above. The Letter of Authorization shall be notarized.

## Transfer of Floodplain Use Permit Agreement

Form 8-3

Floodplain use permits for sand and gravel operations are not transferable without the District's written authorization and submittal of the following agreement:

I/we \_\_\_\_\_ [NAME] am the authorized owner/operator of \_\_\_\_\_  
\_\_\_\_\_ [AGGREGATE MINING OPERATION] verify that I/we have read,  
understand and agree to the terms, conditions, and requirements of the existing floodplain use permit  
\_\_\_\_\_ [PERMIT NUMBER] approved by the District. No changes or modifications to the  
previously approved permit conditions will occur without prior review and approval by the District.

Affix Notary's Seal:

**Assurance of Compliance – Legal Non-Conforming Operations**

**Form 8-4**

I/we \_\_\_\_\_ [NAME] the owner of parcels \_\_\_\_\_  
[PARCEL TAX ASSESSOR CODE] on which a sand and gravel operation is being conducted certify that  
the operation has not exceeded the limits of excavation that were in effect as of July 17, 1975.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Affix Notary's Seal

**Certification of Compliance Letter  
Existing Floodplain Use Permit Renewal or Amendment**

**Form 8-5**

I/we \_\_\_\_\_ [NAME] the operator/owner of the sand and gravel operation permitted under permit number \_\_\_\_\_ issued by the Flood Control District of Maricopa County on \_\_\_\_\_ [DATE], do hereby request renewal of this permit for a period of \_\_\_\_\_ [DURATION] years. I/we certify that the operation has been conducted in accordance with the approved plan of development and that during the renewal period for this permit (if approved) I/we WILL / WILL NOT continue to follow the approved plan of development.

If “will not” is chosen, a revised plan of development must be submitted with this certification, along with the Application for Renewal or Amendment

Signed: \_\_\_\_\_  
Date: \_\_\_\_\_

Affix Notary's Seal:

Notes:

1. If no change to the approved plan of development is requested, the application shall be treated as a RENEWAL. If the plan of development is changed, the application shall be treated as a renewal and an amendment.
2. An application for permit renewal or amendment may be downloaded from <http://www.fcd.maricopa.gov/Permitting/Floodplain.asp>. The Application to Floodplain Administrator and Warning and Disclaimer of Liability must be signed and returned with appropriate fee to:  
Flood Control District of Maricopa County  
2801 W. Durango Street  
Phoenix, AZ 85009

## **Section 9: Approval, Compliance and Site Inspection of Active Permits**

### **Applicant and District Responsibilities**

Assurance of compliance may be determined by aerial photograph interpretation for legal non-conforming sites if possible.

#### **9.1 District Inspections (Provided by District)**

##### **9.1.1 Routine Inspections.**

Form 9-1

District inspectors will in most cases conduct semi-annual inspections of sand and gravel operations located in flood hazard zones to assure compliance with permit conditions. The intent of the inspection is to verify compliance with permit conditions, including the following:

1. Depth of excavation
2. Extent of excavation
3. Side slope
4. Reclamation phasing and condition
5. Structure condition
6. Watercourse condition
7. Evidence of recent channel change or bank erosion
8. Property boundary stakes or markers
9. Condition of on-site temporary benchmark
10. Environmental and agency permit status

Inspections by the District will be conducted in addition to the assurance of compliance to be submitted by legal non-conforming operations and permitted operations. Any restrictions to access by District inspectors should be clearly spelled out in the floodplain use permit application.

Note that property boundaries shall be clearly marked, staked, or fenced for use by District inspectors verifying excavation limits and setbacks.

Routine inspections are scheduled to occur in six month intervals.

##### **9.1.2 Follow-Up Inspections After Notice of Violation**

Form 9-2

#### **9.2 Assurance of Compliance (Provided by Permittee)**

Form 9-3

Assurance of compliance shall be submitted by the property owner or their authorized representative annually and shall include the following:

1. Verification of excavation depth
2. Verification of excavation limits

Assurance of compliance shall consist of a notarized statement by the property owner that the operation is in complete compliance with the stipulated conditions listed in the floodplain use permit as well as with the mining plan documented in floodplain use permit and/or engineering analysis. Documentation of assurance of compliance shall consist of an approved site plan showing the current excavation depth and limits sealed by an appropriate Arizona registered professional surveyor or engineer.



**Flood Control District of Maricopa County**  
**2801 West Durango Street**  
**Phoenix, Arizona 85009**  
**(602) 506-1501 (Office)**  
**(602) 506-7346 (Fax)**

**FORM 9-1**

**COMPLIANCE INSPECTION REPORT**

<b>Permittee:</b>			
<b>Permit Number:</b>		<b>Location:</b>	
<b>Date:</b>	<b>Time:</b>	<b>Inspector:</b>	
<b>Accompanied By</b> (name, affiliation, title, phone #):			
<b>Synopsis</b>			
<p>1) <u>Activity</u>:</p> <p>2) <u>Adverse Affects to Banks</u>:</p> <p>3) <u>Material and Structures in Channel/Floodway</u>:</p> <p>4) <u>Other Materials</u>:</p> <p>5) <u>Maintenance of Drainage and Washes</u>:</p> <p>6) <u>Pit Slopes</u>:</p> <p>7) <u>Pit Setbacks</u>:</p> <p>8) <u>Depth and Extent of Excavation/Operation</u>:</p> <p>9) <u>Other</u>:</p>			
<b>Inspector's Signature:</b>		<b>Date of Report:</b>	

**District Inspector's Checklist**

Project Name \_\_\_\_\_ Floodplain Use Permit # \_\_\_\_\_

Inspector Name \_\_\_\_\_

Date of Current Inspection \_\_\_\_\_ Date of Last Inspection \_\_\_\_\_

## Follow-Up on Previous Non-Compliance Items

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## Watercourse Condition Documentation – describe changes

\_\_\_\_ Attach recent aerial photograph (note changes from previous inspection)

\_\_\_\_ Attach ground photographs (match photo location and aspect from previous inspection if possible)

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## Mining Operations Conditions

\_\_\_\_ Excavation depth

\_\_\_\_ Excavation limits

\_\_\_\_ Property setbacks

\_\_\_\_ Condition of flood control structures

\_\_\_\_ Reclamation – progress vs. schedule

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**Assurance of Compliance**

**FORM 9-3**

Permit Number \_\_\_\_\_ Date \_\_\_\_\_

I/we \_\_\_\_\_ [name], certify that the operation conducted on this site during the previous twelve (12) months has been in accordance with the approved plan of development.

Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Notary Seal: \_\_\_\_\_

Required Attachments: documentation of current excavation depth and limits sealed by a registered professional engineer or surveyor.

Note: This form is to be submitted annually



## **Section 10: General Stipulations**

### **Sand and Gravel Floodplain Use Permits**

The following stipulations may be added to floodplain use permits for sand and gravel operations:

1. The property owner and their authorized representative (if applicable) have read, acknowledge and agree with all the stipulations and conditions of this floodplain use permit.
2. The Floodplain Use Permit shall be limited to five (5) years<sup>4</sup> from the date of approval, but may be renewed provided development has been in conformance to the approved plans, subject to modification made necessary by flow related changes in river morphology. Renewal will be evaluated for compatibility with the [Stream Name] Watercourse Master Plan if applicable.
3. Any substantial change, addition, alteration, modification, or deviation from the approved plan shall have prior approval of the District.
4. The use shall be subject to post-flood review. Modification of the permit may be necessary due to flood-related changes in river morphology.
5. The applicant shall apply for renewal at least six (6) months prior to the permit expiration date.
6. The applicant shall submit annual status reports, including the anticipated extent of activity during the next year.
7. Development shall be in compliance with the plan of development and mine plan report dated [date of plan] prepared by [Engineer] and reclamation plan dated [date of plan] prepared by [Consultant]. The reclamation plan shall be submitted along with the initial application.
8. Excavation depth shall not exceed [elevation or depth] as shown on the approved plan of development.
9. Excavation shall follow the slope(s) and depth(s) as approved on the plan of development.
10. Final reclamation when the mining operation is terminated must include removal of equipment and materials.
11. A reclamation plan is required for all new permit applications and permit renewals. The plan of reclamation and revegetation shall be reviewed at 50% of mining showing that it complies with the approved narrative report.
12. The plan of reclamation shall include backfilling to original ground elevations with inert construction waste material as specified in Section 1002.8 of the Floodplain Regulations for Maricopa County, or otherwise as approved by the Floodplain Administrator.
13. No stockpiling of tailings, overburden or sand and gravel shall obstruct, divert, or retard the natural flow of tributaries to the main watercourse.

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<sup>4</sup> The normal period of a permit is five (5) years. Under special circumstances, e.g., a period in which a Watercourse Master Plan or Watercourse Restoration is pending, a permit may be issued with a validity of less than five (5) years, at the discretion of the Floodplain Administrator, whose decision may be APPEALED in the normal manner.

14. Applicant shall comply and submit proof of clearance from the U.S. Army Corps of Engineers, if needed, prior to commencement of operation.
15. Applicant shall comply and submit proof of compliance with State water quality standards as administered by the Arizona Department of Environmental Quality prior to commencement of operation.
16. The applicant shall be responsible to stay informed of any flooding, storm runoff, or river flows that may be imminent, and for removing any portable equipment and structures, as required by this permit.
17. The applicant shall submit a signed Warning and Disclaimer of Liability Notice on a form provided by the District.
18. Approval of [permit #] does not convey any property rights, either real estate or material, and is not to be construed as consent, approval or authorization to cause any injury to property or invasion of rights or infringement of any Federal, State, or other local laws, rules or regulations nor does it obviate the requirement to obtain other permits. The floodplain use permit is not transferable without the written authorization of the floodplain administrator. Furthermore, the plan review by the District is solely for the purpose of determining that the application conforms with the written requirements of the Floodplain Regulations for Maricopa County and is not to be taken as a warranty that structural plans and specifications meet engineering requirements or standards or are free from failure to perform as described or designed in the application, reports or plans as submitted. Approval does not imply that the total drainage concept for the site has been reviewed or approved by the District.

## **Section 11: Technical References**

### **For Engineering Analysis of In-Stream Mining**

#### **General Technical References – River Mechanics and Sedimentation Engineering**

American Society of Civil Engineers, 1977, *Sedimentation Engineering*, ASCE Manuals and Reports on Engineering Practice-No. 54.

American Society of Civil Engineers, 1997, *Channel Stability Assessment for Flood Control Projects*, Technical Engineering and Design Guides as Adapted from the US Army Corp of Engineers, No. 20.

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## **Section 12: Glossary**

Note: Terms defined in the Floodplain Regulations for Maricopa County are available at [www.fcd.maricopa.gov/services/FCDMC\\_Fldpln\\_Regs\\_00.pdf](http://www.fcd.maricopa.gov/services/FCDMC_Fldpln_Regs_00.pdf).

## **Appendixes: Case Histories**

### **Impacts of In-Stream Sand and Gravel Mining on Channel Stability**

Documentation of flood damages attributed in in-stream sand and gravel mining is provided in the following four accounts from Arizona and the Southwest:

- Appendix A. Case History #1: Bridge Failure  
Indian School Road, Agua Fria River, February 1980
- Appendix B. Case History #2: Headcutting  
Tujunga Wash, February 1969
- Appendix C. Case History #3: Lateral Erosion  
Ina Road, Santa Cruz River, October 1983
- Appendix D. Case History #4: Long-Term Degradation  
Salt River, 1903-2001